have the head and neck grey and not black like the "corbies" in the background. There is evidently some error about these figures, for they are referred to throughout the book as Plates i., ii., &c., whilst the corresponding numbers are only marked on them exceptionally and sporadically.

But although the illustrations are not so good as could be wished—and all who have had experience in similar matters know how very difficult it is to secure good figures of animals—the perusal of the present book may be recommended to all who are interested in the animal life of India.   W. T. B.

ENGINEERING SCIENCE.

Strength and Elasticity of Structural Members. By R. J. Woods, M.Inst.C.E. Pp. xi+310. (London: E. Arnold, 1903.) Price 10s. 6d. net.

DURING the last fifteen years there has been a rapid growth in the number of engineering students taking a full course at one or other of the many institutions in Great Britain and America which offer instruction in the necessary subjects, and as a result there has been a steady stream of text-books written especially for this comparatively new class of college students. The strength and elasticity of materials is a branch of engineering science which must be thoroughly mastered by every student, no matter to what branch of engineering he eventually proposes to devote himself. It is not surprising, therefore, that a number of text-books devoted to this subject have been published during the past few years, and it is hence a somewhat difficult matter for any author to show much originality in his treatment of the problems which have to be solved. Mr. Woods has, however, been able to deal with several points in a fresh and interesting manner. The book will be especially valuable to the private student on account of the very excellent series of examples at the end of each chapter, with the solutions given in every case.

The first chapter is devoted to graphical statics, and after simple definitions of the triangle and polygon of forces, the funicular polygon, and the graphical conditions of equilibrium, the methods of solution are explained, and then applied to the practical problems of the graphical determination of stresses in roofs, girders, and framed structures. In the next three chapters the relations between stress and strain are very fully and carefully discussed, the properties of the ellipse of stress are deduced, and the results are applied to the determination of the principal stresses in a beam. In a text-book of this nature it is very important that complete tables should be given of the weights, strengths, and other properties of the various materials used by engineers in structural work, and it may be well to point out that the tables given on pp. 72 and 73 might have been considerably increased, and certainly would have been improved, by the addition of a column giving the elastic limit in tension for such materials as wrought iron, mild steel, &c.

In dealing with bending and bending moments, a slight inversion of the actual order adopted would probably have facilitated the reading of the private student, that is to say, in chapter v. it would have been better to have placed the formulæ connecting stress and bending moment at the end rather than at the beginning, after all the preliminary work of determination of bending moment, drawing of shear and bending moment diagrams, &c., had been fully treated. The author has introduced into the chapters dealing with beams the graphical methods for finding the equivalent area or modulus of section of beams; this useful piece of work is too often omitted from the ordinary text-books.

As the book was originally written in the form of a series of lectures for students at the Royal Indian Engineering College, it naturally deals with one or two branches of the subject not usually considered in elementary text-books; for example, stresses at the joints in masonry structures, stresses due to earth pressure at the back of retaining walls, and the strength and design of riveted joints for structural work, are all fully discussed. The book is a good, clearly written text-book, and will probably be a useful work of reference not only to the engineering student, but to those engaged in actual practical work.

T. H. B.

SCHOOL GEOMETRY.

Theoretical Geometry for Beginners. Part iii. By C. H. Allcock. Pp. viii+113. (London: Macmillan and Co., Ltd., 1904.) Price 1s. 6d.

Elementary Geometry. Section iii. By Frank R. Barrell, M.A., B.Sc. Pp. viii + 285 to 360. (London: Longmans, Green and Co., 1904.) Price 1s. 6d.

Rudiments of Geometry for Junior Classes. By M. Wilson. Pp. 228. (London: W. R. Russell and Co.) Price 1s. net.

Geometry on Modern Lines. For Elementary Students. By E. Springfield Boulton, M.A. Pp. viii+126. (London: Methuen and Co., 1904.) Price 2s.

THE text-book by Mr. Allcock, of which part iii. is now issued, is an excellent substitute for Euclid for those teachers who wish to confine attention mainly to deductive geometry. Experimental and practical work is not entirely omitted, but it occupies a very subordinate place. The book is very attractive on account of its admirable and incisive style and the beautifully clear manner in which it is got up and printed, and it cannot fail to give satisfaction wherever adopted. The present part includes the more important propositions of Euclid, Book ii., also Book iii., Props. 35–37, and Book iv., Props. 10–16. In many cases the algebraical equivalents follow the geometrical proofs, and mutually illustrate one another. In some of the propositions it would have been a great advantage if simple trigonometrical equivalents could also have been given. A useful chapter on the radical axis is included, and answers to the numerical examples are collected at the end of the book.

The geometry by Mr. Barrell displays very commendable originality in the manner of presentation.

The concluding section treats of solid geometry, after Euclid xi., and of the mensuration of simple solids. Particular care has been taken in regard to the figures; they are drawn in oblique parallel or metric projection, are lightly shaded, and are very effective indeed. A few problems on the setting out of such figures to scale, and of the measuring of dimensions from them, would have been interesting and instructive. Also in this section we should like to have seen some account of the graphic representation and measurement of position in space by means of orthogonal projections. In the geometry of the prism, pyramid, wedge, cylinder, cone and sphere, geometrical, algebraical and trigonometrical methods are very happily and naturally combined, resulting in a fuller treatment than is usually met with in similar text-books; many well selected numerical examples are worked out. The prismoidal formula is explained and applied to specific cases. Altogether the author is to be congratulated on the production and completion of a very excellent text-book of elementary geometry on modern lines.

In the "Rudiments of Geometry" the author gives a course which she claims to have introduced successfully at the Municipal Technical School, Gravesend. It is based on experimental work, and is carried on along with practical geometry. Specific drawing exercises are set, and the pupils are required in each case to write out in their own words an account of what they have done, and of any inferences or discoveries they may have made. Formal proofs then follow, and are intended to be based on the collective suggestions of the class; these in turn are reproduced on paper by each boy or girl independently. There are two appendices containing between four and five hundred exercises in geometry. In these the old school of art course is too prominent. It seems to us that the scheme of the book is unduly extended, and that the work must suffer from lack of freshness and variety before the pupils have proceeded very far.

There is little that we can commend in the geometry of Mr. Boulton. The author attempts to cover too much ground in the comparatively small space available, so that nothing is very satisfactorily accomplished.

OUR BOOK SHELF.

Ansichten und Gespräche über die individuelle und specifische Gestaltung in der Natur. By Franz Krašan. Pp. vii + 280. (Leipzig : Engelmann, 1903.) Price 6s. net.

This quaint but very serious book is an expression of the author's attempts to reach some clearness in regard to the conceptions of species, variety, breed, &c., which he has had to deal with in the course of his botanical studies. He discusses the profoundest questions of biology :—How far is organic form a function of organic substance? What is the nature of reaction to surroundings? Can one distinguish between the original and the accessory characters of individuals? What is the real meaning of metamorphosis and substitution of organs? What is the evolutionary import of variation and mutation and

modification? How are we to define species, variety, and breed? What is the scope of hybridisation and in-breeding, of isolation and selection? In short, Franz Krašan traverses the whole field of evolution-theory. And yet the result, to our mind at least, is deplorable—nothing short of a pathetic waste of careful and assiduous thinking, for he has cast his book in the form of dialogues between Arthur, Erwin, Fritz, Julius, Raimund, Walther, and possibly some others whose acquaintance we have not been able to make! They are most honourable gentlemen, with a facility of discourse and a knowledge of biology that make one blush; they bid one another a most courteous "Auf Wiedersehen" after discussing "System und Phylogenie," or the Hieraciums of Central Europe; they reappear cheerful and cocksure, like Job's friends, to reiterate their various convictions, while the reader undevoutly wishes that they would all die off and leave Franz Krašan to tell us in plain German what he really means.

We are told that the "sachkundige Leser," which we had mistakenly assumed to mean ourselves, should have no difficulty in appreciating the incognitos of Arthur, Erwin, Fritz, and Company, but there are puzzles enough in nature without making more in biological literature, and we "give it up." Not, however, without saying that the author has the results of much careful work and thought to communicate, the pity being simply that he has hidden his light under the bushel of a method of presentation which is anachronistic, repellant and absurd. We hope that he will feel himself impelled to part company with Arthur, Erwin, Fritz, &c., and tell us in a short essay what he really thinks about individual and specific characters as these occur in nature.　　J. A. T.

Vegetationsbilder. By Dr. G. Karsten and Dr. H. Schenck. Plates 48. (Jena : Gustav Fischer, 1903.)

Botanists have been distinctly tardy in taking advantage of the facilities offered for introducing photographic illustration into descriptive books. Some American elementary text-books contain very excellent flower studies and ecological scenes, but practically the only standard work in which full advantage has been taken of photographic reproduction is Schimper's "Pflanzengeographie," in which the epoch-making physiological treatise is embellished with magnificent illustrations.

It may be assumed that the success of Schimper's book prompted the publication of this work, in which the illustrations form the main feature, and the text is added by way of explanation and comment. The work has been issued in eight parts, each of which may be purchased separately, and each part contains six plates illustrative of a particular region or representing plants associated by common characters. Three parts deal with tropical lands in which moisture-loving plants abound, and these contain illustrations of rain-forests in Mexico, Java, and Brazil. The superabundance of vegetation does not lend itself well to photography, but the extraordinary development of climbing aroids and epiphytes is well shown. Another conspicuous feature of these regions is the prevalence of large-leaved plants—species of Heliconia, Calathea, Begonia, and many belonging to the order Melastomaceæ—which constitute the ground vegetation. Owing to the more obvious characteristics and the reduced number of plants growing in dry or exposed situations, the photographs of South African scenes, of the seashore vegetation of Brazil, and of Mexican types are the most successful. Of the general character sketches, interest attaches to that showing the growth of *Ipomoea pes-caprae*, but quite the most striking is the illustration of the spread of the sedge